Using Maps to Communicate Complex Information to a Low-education Population

Anne Chappuis, Luc de Golbéry, Emily Franklin[1]

The context

VIStA (Visual Information Systems for Action) was started in December 2004 in the southern state of Andhra Pradesh, India, by a group of professionals working in rural development and information technology, who share a common vision of all that can be achieved by a wider and more democratic access to information. We believe that information is, in fact, the most important asset in the path to development.

We adopted a village situated in one of the most deprived areas of Andhra Pradesh. Here female literacy is 35% (against the State average of 44%) and one woman for every two men is literate (against 2 for every 3 in the State), and the girl school-dropout rate is amongst the highest and the ratio of girls to boys is amongst the lowest.

Communicating information in this context is very challenging and has to take a visual form. One of the first immediately visible concerns was related to health. It seemed from observation that most of the children were showing dental signs of fluorosis. But the official data from Rural Water Supply Department did not show any problems; in fact it was considered as a safe village for both quality as well as quantity. We decided to conduct a survey of the drinking water sources and measure the fluoride level. Since we did not have the required equipment we contacted another NGO, Accion Fraterna, who was kind enough to lend us the equipment and deputed an engineer to do the analysis. The results were striking: out of 17 drinking water sources, 11 had a level greater than 1 ppm of fluoride, considered as unsafe in tropical condition by UNESCO, and 5 had a level greater than 1.5 ppm. And 3 other neighbouring villages showed the same alarming trend, or even worse.

[1] Dr Anne Chappuis, Visual Information Systems for Action (VIStA), Hyderabad, India,
Dr Luc de Golbéry, Associate Professor, Department of Geography, Université de Rouen, France
Emily Franklin, Department of Graphic Design, London College of Communication, London, UK
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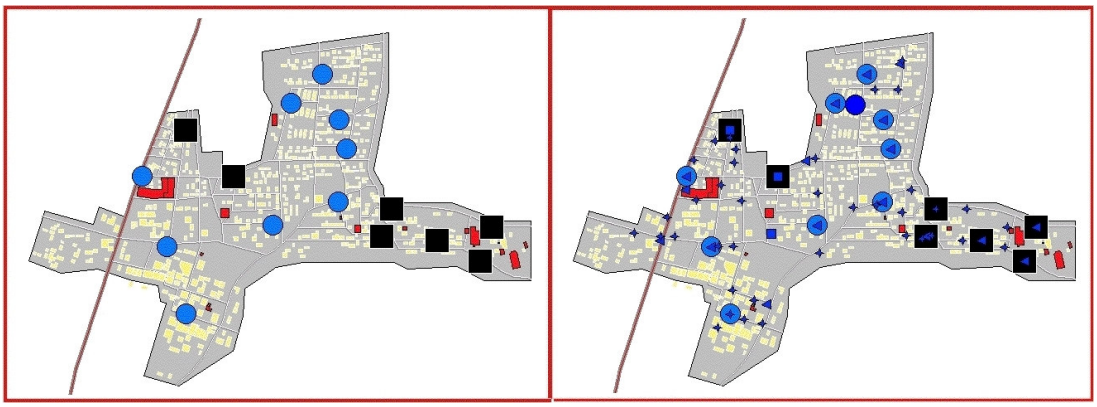
We decided to bring this information to the villagers and organized a meeting where we called everybody. To explain the situation we had prepared a slide show with the first part on awareness---what is fluorosis, how it affects health, etc., with photos---and a second part with a village map locating the wells and showing their water status---unsafe or safe. We were worried that the villagers would not be able to understand the map.

So we first presented the village plan with houses and streets and four landmarks---the big school, a smaller tribal school, the mayor's office and the temple. We first indicated the directions on the main road, "this is going to the South toward the market place, and this is going to the North towards X village". And then we pointed out these landmarks one by one and asked them what they were. And the replies came within seconds from the crowd. To make this an interactive exercise and make sure that everybody understood, we then scrolled the (GIS) map ward by ward and showed several houses with the owners' names. Not only could the villagers locate themselves and their neighbours, but they also pointed out some errors.

Then we showed the map with the wells and their status. The unsafe wells were shown in big black squares, the safe ones in smaller blue circles.

In another map, other water structures such as unused overhead tanks were also shown.



An animated discussion followed, and the next morning groups were found discussing the problem in front of each contaminated well. It was then decided to identify a safe hand-pump source and enlarge the hole to fix a motor to pump the water into the overhead tanks and distribute the safe water to all houses.

How to build maps for a public with low education and what colour schemes to adopt

Protocol of the experiment on visual perception of basic Graphics Semiology Signs

J. Bertin's pioneering work on the Semiology of Graphics[2] first paved the way for the "Semiologic Cartography Revolution" in the 1970s but it could only actually take off when micro-computers became powerful enough to draw, process and display information graphically translated with sufficient speed and accuracy. And this happened in the 1990s.[3]

Bertin's principle is to make the maximum use of human natural visual perception capabilities that are able to transfer from the outer world into our brain several millions of elementary visual signals about 15 times per seconds, perform sophisticated pattern recognition, and deliver to our consciousness images that are instantaneously understood without any felt effort. Harnessing this data-processing power means also multiplying manifold our capability to communicate information as easily as we communicate through photographs or videos, without any preliminary training.

To do so one has to know how this natural visual perception works in daily life, and derive a set of rules and tools to TRANSLATE information into PICTURES that would be SEEN and not READ, the crucial difference being that reading needs training and time to decipher letters, words and sentences, whereas seeing is spontaneous to any normal human being and instantaneous. This is what Semiology of Graphics is about. Bertin discovered that 6 visual

[2] Bertin J.,1967, Sémiologie Graphique, Paris La-haye, Mouton; 1983, Semiology of Graphics, Diagrams, Networks, Maps, the University of Wisconsin Press, Madison, USA.

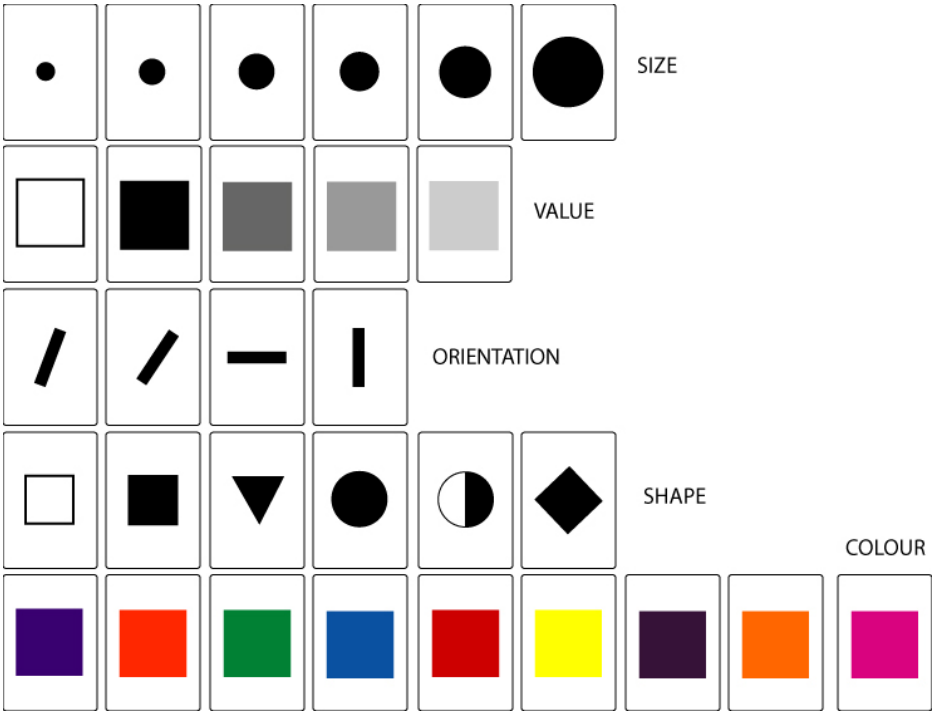
[3] Semiology of Graphics is becoming increasingly relevant as powerful tools like Geographic Information Systems (GIS) allow handling of many thousands of geographical objects, each bearing thousands of information, qualitative or quantitative, and only visual representation of these huge data bases can help analyse and synthesize them.

variables work in our vision. They are spontaneously perceived with different levels of organization that are closely related with the way we organize every thing, including information. All we have to do is to apply the proper variable to the proper set of information, at least in theory. Practice is always a little trickier, very much like the world around us.

We have done experiments at the University of Rouen, France, with first year students of the Geography Department to verify how far the rules of graphic semiology are valid. The results were striking.[4] We naturally planned to apply them to solve our communication problems in Indian villages. But we felt a re-evaluation of the universal validity of GS was necessary as we were now facing totally uneducated people, who had never been exposed to notions like order, hierarchy, quantities, etc., in a formal way.

Five visual variables were tested: SIZE, VALUE, ORIENTATION, SHAPE and COLOUR. The sixth one, TEXTURE, is too difficult to explain and utilize and is too close to SIZE and can be mistaken for it and create confusion during tests.

Sets of cards (imitating playing cards that people use regularly in villages) were prepared; six representing the variable SIZE, 5 representing VALUE, 4 representing ORIENTATION, 6 representing SHAPE, 9 representing COLOUR.

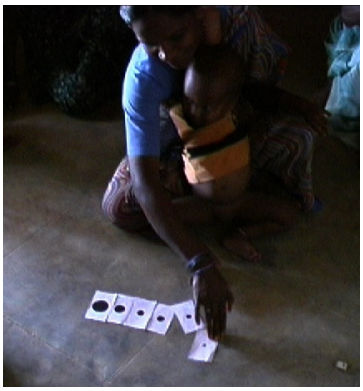


Each person was taken aside so that s/he could not be influenced by anybody nor could they in turn influence or bias any future examinee. The test started with the set of 6 SIZES that 159 examinees were asked to reorganize according to her/his perception of order.

It will be seen from the results, the notion of reorganization was not clear to every body. Most interesting were the differences in comprehension between illiterates and literates. In certain cases one could observe a person discovering the very existence/possibility/idea of a variation

[4] Cf. de Golbéry L., Orhan J.M., Chappuis A., le Rolland P., Sémiologie Graphique: le Retour ? 17ème Conference Cartographique Internationale, Barcelone, Septembre 1995. Comité Français de Cartographie, bulletin n°146-147 décembre 1995

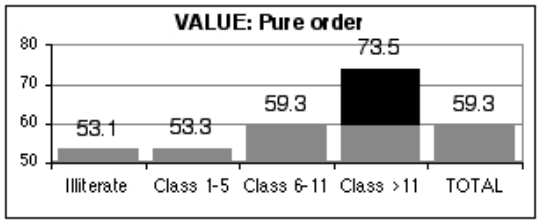
in value or size, etc. This capacity to discover a new concept has emerged as an important point. This will be explored later as it begs a more sophisticated approach.



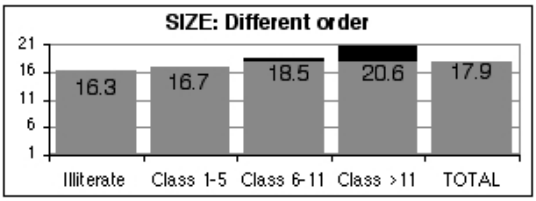


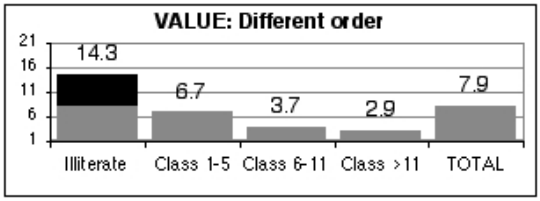
Results for SIZE and VALUE, and their combination

The natural order of SIZE, from small to big, or big to small, and of VALUE, from light to dark, or dark to light, was found by a majority of the people. The more so with SIZE, 64% against 59% for VALUE. And there is no doubt that education plays a role as 76% and 73% of people with higher education, against 55% and 53% of illiterates, put the cards in order.

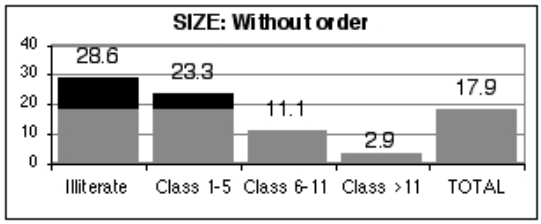


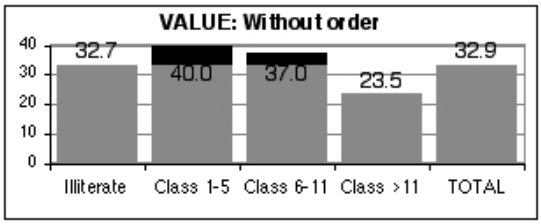
Interestingly 18% gave another order for SIZE, starting from the middle, either with the biggest or with the smallest circle, and going in descending or ascending order on each side. The variation with education was negligible here. In VALUE, 8% of the total number of people (and 14% of illiterates) gave another organization---alternating light with dark.



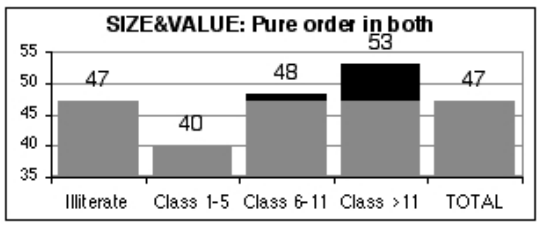


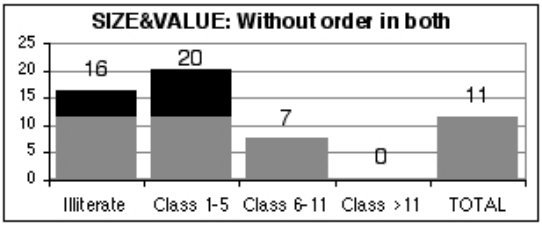
The percentage of people not able to give an order was 18% for SIZE and 33% for VALUE. It may be noted that the variation between literates and illiterates is greater in SIZE than in VALUE. Here it seems that the concept of ordering, which is learnt in schools in the West, and treated as natural, is not such a natural one.





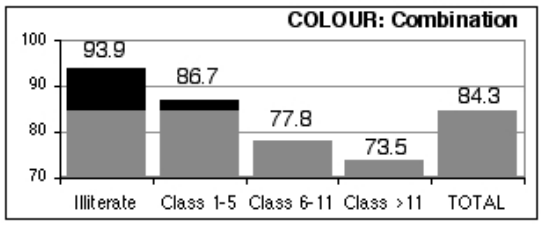
People who could organize both SIZE and VALUE were less than half (47%). People with higher education (53%) were able to organize both SIZE and VALUE. Those who could not organize either SIZE or VALUE were either illiterates or had low educational qualification (16% and 20% respectively). The remaining examinees were able to organize only one of the two.

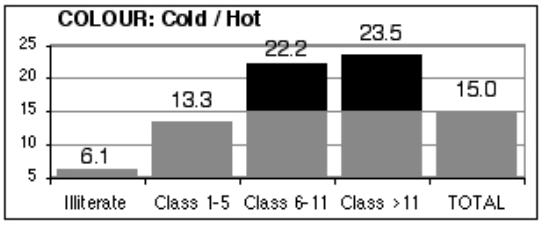




Results for COLOURS

COLOURS are different in that they cannot be easily ordered or weighted. Cultural perception will always play a big role in organizing something like COLOUR. It is interesting to note that the old Indian tradition of matching colours, such as found on saris and their borders, was clearly the choice of the majority: 84% of the examinees organized COLOURS in contrasting pairs, and this percentage was higher (94%) among uneducated people, and lower (73%) among those with education. In the latter category some organized the COLOURS into Hot/Cold (or vice-versa). Only one person organized the COLOURS into a reverse rainbow.

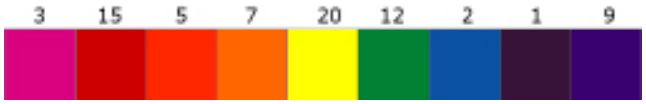




Colour combinations

Colour: Cold / Hot

Colour: Rainbow



Cultural meaning of colours

To assess the cultural meaning of colours if any, we organized group discussions with each community in the village. Some colours had a meaning unanimously accepted: black indicated danger, white indicated goodness. Other colours did not carry any unanimity of meaning but the majority agreed that purple indicated danger whereas green, pink and yellow were auspicious or benign colours. Colours such as red were ambiguous because it was both an auspicious colour (brides wear red clothes at their wedding) as well as a colour of danger (linked to blood). These findings will help us build maps that will be more accessible to villagers.